Claims

1. Printing element for simulating tonal values on a printing substrate having a plurality of printing elements distributed over the area of a printing dot, characterised in that the individual printing element (17, 17') is bounded by S-shaped lines (15) alone and the lines include an angle ≤ 90° at all the corners of the printing element.

2. Printing element according to claim 1, characterised in that the printing element (17, 17') has at least three lines (15) forming its sides.

3. Printing element according to one of the foregoing claims, characterised in that each line (15) forming a side starts at the corner with a line descending into a valley (15') and ends with a line descending from a hump (15") or, the other way round, starts with a line ascending to a hump (15") and ends with a line ascending from a valley (15').

4. Printing element according to one of the foregoing claims, characterised in that the lines forming the sides of the printing element are all the same length.

5. Printing element according to one of the foregoing claims, characterised in that a printing element is bounded by four lines forming sides (Fig.2).

6. Printing element according to claim 5, characterised in that the printing element is in the form of a four-bladed propeller (Figs.2-5) having blades all of the same shape.

7. Printing element particularly according to one of the foregoing claims, characterised in that if the printing element (17') is mirrored in a direction transverse to an axis (X - X) running through the centre and the points of reversal and between the opposing sides, such as S-shaped lines (15), a printing element of the same size and shape is obtained (Fig.3).

8. Printing element according to claim 7, characterised in that in a printing process involving a plurality of colours (four-colour printing) the mirrored form is in each case coloured in a different colour.

9. Printing element according to claim 8, for four-colour printing in the colours black, cyan, magenta and yellow, characterised in that a printing element added to by mirroring is produced by two printing elements of the colours cyan and yellow and on the other hand of the colours magenta and black.

10. Printing element according to claim 8, for four-colour printing in the colours black, cyan, magenta and yellow, characterised in that a printing element added to by mirroring is produced by two printing elements of the colours cyan and magenta and on the other hand of the colours yellow and black.

11. Printing element according to claim 8, for four-colour printing in the colours black, cyan, magenta and yellow, characterised in that a printing element added to by mirroring is produced by the two printing elements of the colours cyan and black and on the other hand of the colours magenta and yellow.

12. Printing element according to one of the foregoing claims, characterised in that a printing element is bounded by six lines forming sides and a plurality of printing elements in a printing dot are associated with one another in propeller form.

13. Printing element according to one of the foregoing claims, characterised in that the printing elements which are arranged next to one another in the printing element - without being arranged in a chessboard pattern - are so associated with one another that, at any tonal value, and even when the tonal value varies, the distances (lands 18) between the two adjoining S-shaped lines forming sides and the next printing element are constant along the length of the S-shaped line forming a side.

14. Printing element according to one of the foregoing claims, characterised in that the four lines forming the sides obey the following formulas:

The formulas relate to the unit area of dimensions $x \in [-E;E]$ and $y \in [-E;E]$ where $E \in = [0;+\infty]$. The zero point (0;0) is the centre of the unit area.

For all the radiuses r_i:

$i \in \{1;2;3;4;5;6;7;8\}$

$r1 = r2 = r3 = r4 = r5 = r6 = r7 = r8$

$r_i \in [E/2;+\infty]$

For point $(x_1;y_1)$:

$x_1 = E - \sqrt{(r_i2 - (E/2)^2)}$

$y_1 = E/2$

For point $(x_2;y_2)$:

$x_2 = E/2$

$y_2 = E = \sqrt{(r_i2 - (E/2)^2)}$

For point $(x_3;y_3)$:

$x_3 = -E/2$

$y_3 = E - \sqrt{(r_i2 - (E/2)^2)}$

For point $(x_4;y_4)$:

$x_4 = -E - \sqrt{(r_i2 - (E/2)^2)}$

$y_4 = E/2$

For point $(x_5;y_5)$:

$x_5 = -E + \sqrt{(r_i2 - (E/2)^2)}$

$y_5 = -E/2$

For point $(x_6;y_6)$:

$x_6 = -E/2$

$y_6 = -E - \sqrt{(r_i2 - (E/2)^2)}$

For point $(x_7;y_7)$:

$x_7 = -E/2$

$y_7 = -E + \sqrt{(r_i2 - (E/2)^2)}$

For point $(x_8;y_8)$:

$x_8 = E + \sqrt{(r_i 2 - (E/2)^2)}$

$y_8 = -E/2$

Points $(x_i;y_i)$ are the centres of the respective radiuses r_i.

For all points $(x_i;y_i)$:

$x_i \in [-\infty;+\infty]$

$y_i \in [-\infty;+\infty]$

These formulas are correct for a printing element as shown below:

(see page 11 of German original)